

TABLE OF CONTENTS

SUMMARY

1	INTRODUCTION	1
1.1	HOME COMPOSTING OVERVIEW	1
1.2	HOME COMPOSTING IN WASTE MANAGEMENT	2
1.3	BENEFITS OF HOME COMPOSTING ORGANIC WASTE	2
	1.3.1 Financial	2
	1.3.2 Environmental	2
	1.3.3 Technical	2
1.4	SIGNIFICANCE OF THE RESEARCH	3
1.5	OBJECTIVES	3
1.6	OUTLINE OF THE REPORT	3
2	LITERATURE REVIEW	5
2.1	POLICY AND LEGISLATIVE CONTEXT	5
	2.1.1 Definition of waste	5
	2.1.2 Waste disposal routes	5
	2.1.3 Waste production	7
	2.1.4 Factors influencing the introduction of alternative options to landfill	8
	2.1.5 UK waste management policy	8
	2.1.6 Composting as a waste management option	9
	2.1.7 Summary	16
2.2	EXPERIENCE WITH COMPOSTING	
	2.2.1 Composting practice in EU countries	16
	2.2.2 Composting in the UK	18
	2.2.3 Home composting	19
	2.2.4 Summary	26
2.3	RUNNYMEDE BOROUGH COUNCIL	26
	2.3.1 Introduction	26
	2.3.2 Background	26
	2.3.3 Waste inventory	26
	2.3.4 Current waste collection and disposal practices	27
	2.3.5 Composting in RBC	28
	2.3.6 Cost of waste collection	29
	2.3.7 Summary	30
2.4	COMPOST MANAGEMENT PRACTICES	30
	2.4.1 Introduction	30
	2.4.2 Microbiological aspects of composting	32
	2.4.3 Biochemical reactions	33
	2.4.4 Biological succession	35
	2.4.5 Types of composting system	36
	2.4.6 Environmental factors	37
	2.4.7 Composting maturation	40
	2.4.8 Summary	42
2.5	COMPOST UTILISATION	42
	2.5.1 Introduction	42
	2.5.2 Peat substitution	42
	2.5.3 Horticultural applications for home and MSW compost	43
	2.5.4 Properties of compost	44
	2.5.5 Summary	45

2.6	COMPOST QUALITY	45
2.6.1	Introduction	45
2.6.2	Standards	45
2.6.3	Health and safety in relation to home composting	49
2.6.4	Summary	52
3	GENERAL MATERIALS AND METHODS	54
3.1	HOME COMPOSTING TRIAL	54
3.1.1	Preparation and rationale	54
3.1.2	Home Composting Study Trial participant recruitment	54
3.1.3	Home composting procedure and equipment	54
3.1.4	Experimental treatments	55
3.2	MASS BALANCE ANALYSIS	56
3.3	COMPOST PROCESS MONITORING	56
3.3.1	Temperature	56
3.3.2	Gas composition	56
3.4	LABORATORY ANALYTICAL PROCEDURES	57
3.4.1	Oven-dry moisture content	57
3.4.2	pH	57
3.4.3	Electrical conductivity (EC)	57
3.4.4	Loss on ignition/organic C	58
3.4.5	Extractable NH ₄ -N, NO ₂ -N and NO ₃ -N	58
3.4.6	Total N and P	58
3.4.7	Extractable P	58
3.4.8	Total Mg and K	59
3.5	STATISTICAL ANALYSIS	59
4	EFFECT OF HOME COMPOSTING ON THE DIVERSION OF BIODEGRADABLE HOUSEHOLD WASTE FROM LANDFILL DISPOSAL	60
4.1	INTRODUCTION	60
4.2	WASTE INPUTS TO HOME COMPOST BINS	60
4.2.1	Kitchen waste	60
4.2.2	Paper	62
4.2.3	Garden waste	63
4.3	MASS BALANCE OF WASTE INPUTS AND OUTPUTS FROM HOME COMPOST BINS	64
4.4	IMPACT OF HC ON WASTE GENERATION IN STUDY AREA	66
4.5	SUMMARY	73
5	COMPOSTING PROCESS MONITORING	75
5.1	INTRODUCTION	75
5.2	TEMPERATURE INVESTIGATIONS	75
5.2.1	Monitoring by homeowners	75
5.2.2	Profile monitoring	76
5.2.3	Main treatment effects on compost temperature profiles	76
5.2.4	Compost temperature in relation to waste inputs	79
5.2.5	Summary	80
5.3	GASEOUS PHASE INVESTIGATIONS	80
5.3.1	Oxygen concentrations	80
5.3.2	Carbon dioxide concentrations	84
5.3.3	Methane concentrations	87
5.4	DISCUSSION	90
5.4.1	Temperature in relation to composting activity	90
5.4.2	Gas composition in relation to composting activity	90

	5.4.3	Gas composition in relation to management regimes	90
	5.4.4	Discussion summary	92
6		COMPOST QUALITY ANALYSIS	93
	6.1	INTRODUCTION	93
	6.2	CHEMICAL CHARACTERISTICS OF HOME COMPOST	93
	6.3	CHEMICAL QUALITY AND WASTE RELATIONSHIPS	95
	6.4	COMPOST QUALITY AND MANAGEMENT TREATMENT EFFECTS	108
	6.5	SUMMARY	108
7		AIRBORNE RELEASE OF <i>ASPERGILLUS FUMIGATUS</i> FROM HOME COMPOST BINS	110
	7.1	INTRODUCTION	110
	7.2	MATERIALS AND METHODS	110
		7.2.1 Media preparation	110
		7.2.2 Sampling procedure	111
		7.2.3 Confirmation and enumeration	111
		7.2.4 Quality assurance	112
	7.3	RESULTS AND DISCUSSION	112
		7.3.1 Enumeration of <i>A. fumigatus</i>	112
		7.3.2 Effects of compost bin management on airborne emissions of <i>A. fumigatus</i>	113
		7.3.3 <i>A. fumigatus</i> in relation to waste inputs	114
		7.3.4 Guidance to home compost producers	115
	7.4	SUMMARY	115
8		FRUIT FLY POPULATION DENSITIES IN THE VICINITY OF HOME COMPOST BINS	117
	8.1	INTRODUCTION	117
	8.2	MATERIALS AND METHODS	117
	8.3	RESULTS	119
	8.4	SUMMARY	122
8		EFFECTIVENESS OF HOME PRODUCED COMPOSTS AS SOIL IMPROVERS FOR THE GROWTH OF <i>PETUNIA GRANDIFLORA</i> F₁H	123
	9.1	INTRODUCTION	123
	9.2	MATERIALS AND METHODS	123
	9.3	RESULTS AND DISCUSSION	126
		9.3.1 Chemical characteristics of home compost and peat	126
		9.3.2 Chemical properties of amended soil	126
		9.3.3 Plant growth performance	126
		9.3.4 Plant nutrient status	131
	9.4	DISCUSSION	131
10		SOCIO-ECONOMIC AND DEMOGRAPHIC FACTORS INFLUENCING HOME COMPOSTING IN THE BOROUGH OF RUNNYMEDE	135
	10.1	INTRODUCTION	135
	10.2	MATERIALS AND METHODS	135
		10.2.1 Questionnaire 1	135
		10.2.2 Feedback questionnaires 2 and 3	136
	10.3	RESULTS AND DISCUSSION	136

10.3.1	Homeowner responses to questionnaires distributed to the Study Area	136
10.3.2	Feedback questionnaire from homeowners involved in the experimental investigation	140
10.4	SUMMARY	147
11	GENERAL DISCUSSION AND CONCLUSIONS	148
11.1	SIGNIFICANCE OF THE RESEARCH	148
11.2	WASTE INPUTS AND DIVERSION FROM LANDFILL	148
11.3	WASTE STABILIZATION IN HOME COMPOSTERS	149
11.4	COMPOST TEMPERATURE AND GAS PROFILES	149
11.5	HOME COMPOST QUALITY	149
11.6	AIRBORNE RELEASE OF <i>ASPERGILLUS FUMIGATUS</i> FROM HOME COMPOST BINS	150
11.7	FRUIT FLY POPULATION DENSITIES IN THE VICINITY OF HOME COMPOST BINS	150
11.8	HOME COMPOST END-USE	150
11.9	SOCIO-ECONOMIC AND DEMOGRAPHIC ANALYSIS	150
11.10	HOME COMPOSTING GUIDANCE FOR LOCAL AUTHORITIES	151
11.11	FURTHER RESEARCH	152
11.12	CONCLUDING COMMENTS	153
12	REFERENCES	154
	APPENDICES	170